

INGEKOMEN 21 JUNI 2011

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**Subject**

Assessment fire resistance – variants of fire doors on the basis of test report with nr.  
2010-Efectis-R0427  
**Efectis-report<sup>1</sup> 2010-Efectis-R1214(E)**

**Date**  
June 16, 2011

**Our reference**  
2010-Efectis-R1214(E)/BGG/DNA

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**Efectis Nederland BV:**  
**a TNO company**

The Standard Conditions for Research Instructions given to TNO, as filed at the Registry of the District Court and the Chamber of Commerce in The Hague shall apply to all instructions given to Efectis; the Standard Conditions will be sent on request.

Dear Mr. Schilt,

You have requested Efectis Nederland B.V. to perform an assessment on the fire resistance of various versions of door constructions of type AL-D/D 50-B, of which a specific version has been tested. These test results are described in report 2010-Efectis-R0427.

You have asked to assess the influence on the fire resistance of some optional variations in the construction.

The assessment will be given on the basis of Annex A of NEN 6069:2005.

<sup>1</sup> Voor u ligt een rapport van Efectis Nederland BV (voorheen TNO Centrum voor Brandveiligheid). Efectis Nederland BV en het zusterbedrijf Efectis Frankrijk, zijn sinds 1 januari 2008 volle dochters van de Efectis Holding SAS, waarin TNO en het Franse CTICM, participeren. De activiteiten van het TNO Centrum voor Brandveiligheid zijn sinds 1 juli 2006 ondergebracht in Efectis Nederland BV. Dit is ingegeven door de internationale marktontwikkelingen en klantvragen. Om de klantvragen nog beter te kunnen beantwoorden, en een breder pakket aan diensten en faciliteiten van een hoge kwaliteit aan te kunnen bieden, is de internationale samenwerking verder uitgebreid. Dit is gedaan met ervaren, en in de brandveiligheids sector bekende, partners in Noorwegen (Sintef-NBL), Spanje (Afiti-Licof), Duitsland (IFT), de Verenigde Staten (South West Research Institute) en China (TFRI). Nadere informatie hierover is te vinden op onze website.

## Assessment

The assessment is based on the following criteria which according to NEN 6069:2005 are valid for door constructions:

- **integrity**

This criterion stipulates that, as the word says, in the door construction no openings are allowed through which hot / unburnt gasses or flames are passing to the not-directly exposed side.

- **heat radiation**

This criterion stipulates that in the case of fire at one side of the door construction, the heat radiation at the not-directly exposed side of the construction is limited to a maximum of 15 kW/m<sup>2</sup>, measured at 1 meter distance of the construction.

The assessment has further been based on the currently available knowledge and experience at Efectis w.r.t. to the experimental determination of the fire resistance of the type of constructions under consideration. In particular, the following test reports have been used which were prepared for your company.

### Efectis NL report 2010-Efectis-R0427

In this test report the results are described of a fire test carried out on a double leaf door construction, type AL-D/D 50-B, mounted in a filled, steel frame. The tested door leaf dimensions were: 1053 x 2383 x 80 mm (width x height x thickness). The construction was equipped with a 2-point lock in the active door leaf; the passive leaf was fixed at the top and the bottom. The door leaves were equipped with a anti panic device, and applied "pivoting away from the fire".

The fire test was performed according to EN 1634-1:2008, from which the results can be summarised as follows:

- integrity : 78 minutes
- heat radiation : 78 minutes (end of heating).

### TNO-report 98-CVB-R0544

In this test report the results are described of fire tests carried out on two types of single leaf door constructions, type Soundshield 83 F-B-30 en Soundshield 83 F-B-60, mounted in a filled, steel frame. The tested door leaf dimensions were: 930 x 2115 x 84 mm (width x height x thickness). The construction was equipped with a single-point lock.

The fire test was performed according to NEN 6069:1997, from which the results can be summarised as follows:

#### *Type Soundshield 83 F-B-30 :*

- pivoting towards the fire : 34 minutes
- pivoting away from the fire : 81 minutes

#### *Type Soundshield 83 F-B-60 :*

- pivoting towards the fire : 72 minutes
- pivoting away from the fire : 72 minutes

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These test results can be used within the scope of Annex A of NEN 6069:2005.

You have requested an assessment for the following changes or variations in the tested construction:

1. maximum allowable door leaf dimensions,
2. T-profile in door leaf,
3. perforation and Kerafix Board around the door leaf,
4. door leaves “pivoting towards the fire” and locking,
5. built-in door closer,
6. “noise reduction” in the door leaf,
7. application of window in door leaf,
8. application “automatic drop seal”,
9. veneer finish on door leaf,
10. application and location of “dog bolts”,
11. application corner frame,
12. application of extended hinges.

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#### Ad 1 maximum allowable door leaf dimensions

During the fire test which has been carried out, a certain “overrun” was achieved in the obtained test result. In the European regulations, based on achieved “overrun”, maximum allowable percentages size increase are given. For 60 minutes fire resistance, the following maximum sizes for the door leaves are allowed:

- Maximum width = 1211 mm;
- Maximum height = 2740 mm; and
- Maximum area = 3,01 m<sup>2</sup>.

Of course, the other conditions from test report 2010-Efectis-R0427 remain valid.

#### Ad 2 T-profile in door leaf

During the fire test carried out on the AL-D/D 50-B construction, a T-profile was mounted in the door leaves, see Annex 1 of this letter.

Since this T-profile has no influence on the deformations of the construction in the case of fire, Efectis has the view that it is allowable to assemble to door leaf without this T-profile. In this case, the fire resistance performance as demonstrated in the fire test is retained. Of course, the other conditions from test report 2010-Efectis-R0427 remain valid.



**Ad 3 perforation and Kerafix Board around the door leaf**

During the fire test carried out on the AL-D/D 50-B construction, in the rim around the door leaves, perforations were made and Kerafix Board was applied, see Annex 2 of this letter.

The perforations and the Kerafix Board in the rim of the door leaves was applied for reasons of a better performance in *thermal insulation*. This is however not required for the criteria *integrity* and *heat radiation* which are relevant for the assessment of fire resistance in The Netherlands. Therefore, it is Efectis view that it is acceptable to assemble the door leaves without these perforations and Kerafix Boards. In this case, the fire resistance performance as demonstrated in the fire test is retained. Of course, the other conditions from test report 2010-Efectis-R0427 remain valid.

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**Ad 4 door leaves “pivoting towards the fire” and locking**

During the fire tests carried out on the Soundshield doors (see TNO report 98-CVB-R0544), the constructions were equipped with a single-point lock. For both cases with the door leaves “pivoting towards the fire” and “pivoting away from the fire”, this has functioned adequately.

De double leaf construction has been tested only for the case “pivoting away from the fire”. Based on the available test evidence in the test reports 98-CVB-R0544 en 2010-Efectis-R0427, it is the Efectis view that:

- the double leaf version may be applied “pivoting towards the fire”,
- the active door leaf of the double door construction may be equipped with a single-point lock for the case “pivoting away from the fire”,
- a single leaf version, constructed according to test report 2010-Efectis-R0427, may be applied.

Under these conditions, the fire resistance performance as demonstrated in the fire test is retained. Of course, the other conditions from test report 2010-Efectis-R0427 remain valid.

**Ad 5 built-in door closer**

During the fire test carried out on the AL-D/D 50-B construction, a face-fixed door closer was applied. Optionally, you want to apply a built-in door closer of type DORMA ITS 96 EN 2-4, see Annex 3 of this letter.

With this type of door closer, various successful fire tests have been performed. For this reason, it is the Efectis view that it is acceptable to apply optionally an integrated / built-in door closer of type DORMA ITS 96 EN 2-4. Under these conditions, the fire resistance performance as demonstrated in the fire test is retained. Of course, the other conditions from test report 2010-Efectis-R0427 remain valid.

**Ad 6 “noise reduction” in the door leaf**

During the fire test as described in TNO report 98-CVB-R0544, in the door leaf an acoustic layer was applied consisting of anti-drumming sheets and mineral wool. The exact composition of the layer is described in the TNO report. From the test report it appears that this acoustic layer does not cause the formation of flammable gasses or flames in the case of fire.

For this reason, it is the Efectis view that it is acceptable to install optionally an acoustic layer, from another supplier but with the same chemical content as tested, and applied in the same manner as tested and described in TNO report 98-CVB-R0544. Under these conditions, the fire resistance performance as demonstrated in the fire test is retained. Of course, the other conditions from test report 2010-Efectis-R0427 remain valid.

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**Ad 7 application of window in door leaf**

During the fire tests which have been performed, no window was installed in the door leaves. However, optionally you would like to install a window. This window will have maximum dimensions of Ø320 mm or rectangular 300 x 400 mm, see the drawings in Annex 4.

Windows in door leaves, and fire resistant glass types in general, have been extensively tested. Various types of glass are tested and are suitable for application with a fire resistance of either 30 or 60 minutes. For application of a window in a door leaf, it is necessary that a test report is available in which it is shown that the glass is suitable for the intended fire resistance.

In case such test report is available, it is the Efectis view that it is acceptable to install a window with maximum dimensions of Ø320 mm or rectangular 300 x 400 mm according to the drawing in Annex 4. Under these conditions, the fire resistance performance as demonstrated in the fire test is retained. Of course, the other conditions from test report 2010-Efectis-R0427 remain valid.

**Ad 8 application “automatic drop seal”**

During the fire tests which have been performed, a seam with a width of approx. 5 mm was present at the bottom of the door leaf. As an option, you want to install at the bottom of the door leaf an automatic drop seal of type Schall EX Ultra (manufactured by Athmer), see the drawing in Annex 5.

Most of the time, during fire tests on door constructions, the lower area of the door leaf is less critical. This is primarily due to the under-pressure in this area (ambient air flows into the furnace). An automatic door seal closes the opening between the door leaf and the floor, which has a positive influence on the potential outflow of flames. On the other hand, for the automatic door seal a recess in the door leaf is required. This recess is however relatively small; i.e. a width of 12 mm compared to the door leaf thickness of 80 mm.

For this reason it is the Efectis view that it is acceptable to optionally install an automatic door seal of type Schall EX Ultra (manufactured by Athmer). Under these conditions, the fire resistance performance as demonstrated in the fire test is retained. Of course, the other conditions from test report 2010-Efectis-R0427 remain valid.



Note: it is also allowable to implement the door Construction at the bottom without a sill. In this case it is required to install a double layer of intumescent material at the bottom of the door leaf. The maximum width of the seam below the door leaf is 6 mm.

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**Ad 9 veneer finish on door leaf**

During the fire test which has been performed, the door facing was made of 2 mm and 1,5 mm thick electro galvanized steel sheet. The door facing was not further coated or treated. You wish to optionally fit the door leaf surface with a veneer finish.

It is the experience that – in a fire situation – veneer finishes on door leaves could ignite at the not-directly exposed side, which is not acceptable. The possible ignition of a veneer finish depends on the following 2 factors:

- the surface temperatures on the door leaf; and
- the “ignitability” of the veneer finish.

The measured surface temperatures on the door leaf, during the fire test, were at maximum approx. 250 degrees Centigrade. You have handed over test results for a veneer of type Belbien EX with a thickness of 0.19 mm. For this it appears that this type of veneer has “low flame spread” when tested according to IMO FTPC Parts 2 en 5. On the basis of this test evidence it is concluded that veneer of type Belbien EX will not ignite within the fire resistance period of 60 minutes.

It is therefore in the view of Efectis NL acceptable to optionally apply a veneer finish of type Belbien EX (with a thickness of 0.19 mm). Under these conditions, the fire resistance performance as demonstrated in the fire test is retained. Of course, the other conditions from test report 2010-Efectis-R0427 remain valid.

**Ad 10 application and location of “dog bolts”**

During the fire tests which have been performed, “dog bolts” were applied at 5 cm distance from both corners of the door leaf (ref. TNO report 98-CVB-R0544, the Soundshield doors). Further, a test has been done with “dog bolts” at the location of the hinges (ref. test report 2010-Efectis-R0427, the ALD door).

Both methods functioned adequately during the fire test. It is therefore in the view of Efectis NL acceptable to optionally use one of both tested methods. Under these conditions, the fire resistance performance as demonstrated in the fire test is retained. Of course, the other conditions from test report 2010-Efectis-R0427 remain valid.

Ad 11 application corner frame

During the fire tests which have been performed, a “block” type of frame was applied. You have now requested to apply optionally a “corner” type of frame, see the drawing in Annex 6.

In the view of Efectis NL it is acceptable to optionally install a corner type of frame. It is however essential that the method of fixation of the frame and the latches and hinges of the door remain identical to the tested version. The frame shall be filled with a moisture-containing material, such as gypsum or (concrete) mortar.

Under these conditions, the fire resistance performance as demonstrated in the fire test is retained. Of course, the other conditions from test report 2010-Efectis-R0427 remain valid.

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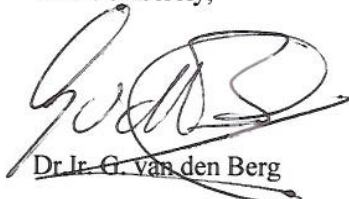
Ad 12 application of extended hinges

During the fire tests which have been performed, “normal” hinges were applied. You have now requested to apply optionally extended hinges. This means that the axis of the hinge has been moved away from the frame, see the drawing in Annex 7.

In the view of Efectis NL it is acceptable to optionally install extended hinges with a distance of the axis of the hinge to the edge of the frame not more than 30 mm. It is however essential that the “dog bolts” are applied according to the tested version of the doors.

Under these conditions, the fire resistance performance as demonstrated in the fire test is retained. Of course, the other conditions from test report 2010-Efectis-R0427 remain valid.

Yours sincerely,



Dr Ir. G. van den Berg



P.A. Ram

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